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Tactile Stimulation Of The Premature Infant

A Thesis

Presented to

the Faculty of the Graduate School

University Of The Pacific

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Dianne Kennedy

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This thesis, written and submitted by

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is approved for recommendation to the Committee on Graduate Studies, University of the Pacific.

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Dated

Abstract

A soft, light-weight, beige, stuffed toy was placed in direct body contact with stable, 30-34 wk gestation infants. Length of hospitalization, activity level, length of time to return to birth weight, and parent visiting rate were recorded for the randomly assigned 10 experimental and 10 control infants. Contrary to predictions, significant differences were found in the length of hospitalization and weight gain, with the control group being discharged sooner and returning to birth weight faster. No significant differences occurred in the parent visiting rate, and only minimal positive results were seen in the activity level for the experimental group. The disproportionate number of younger, smaller, sicker infants in the experimental group was believed to be a reason for these unexpected results.

Tactile Stimulaton Of The Premature Infant

The definition of "prematurity" has changed as medical technology has advanced. In 1948, at the First World Health Assembly, a definition for prematurity was adopted which specified infants weighing 2500 gm (5½ lbs) or less as immature (Drillien, 1964). Presently, the definition of prematurity includes the gestational age of the infant, along with a weight of 2500 gm or less. Normal length of gestation is 40 weeks; premature infants deliver prior to completion of 37 weeks (Thomas, 1977), and account for approximately 8% of live births a year (Thomas, 1977).

During the forties the medical profession prescribed keeping premature infants warm and feeding them with an eye dropper. Infants were swaddled in soft material and rocked near the fireplace. This crude medical care provided something that was later omitted in the care of premature infants.

In the early sixties, there was growing recognition that mortality and morbidity could be greatly reduced by using neonatal intensive care units

(Sheldon & Dominiak, 1980). With the use of isolettes, infants became separated from their parents and were isolated from various sounds, motions, and sensations. Physical interaction between parent and child was discouraged for fear of infection and over-stressing an already compromised infant. Infants were laid out flat, uncovered for visual observation, and surrounded by the constant hum of the isolette providing warm circulating air. While a decline in respiratory, cardiac, and infectious diseases was noted, it was not until these infants grew to school age, that questions concerning the behavioral effects of sensory deprivation began to be raised.

Comparison With Normal Newborns

Infants in intensive care nurseries (ICN) receive much less human contact than normal newborns of the same post-birth age. Marton, Dawson, and Minde (1980) discovered that the premature infants observed in their study received an average of approximately 8 min per hour of hands-on contact with nursery personnel. Rosenfield (1980) found initial visiting rates of mothers of very premature infants to average less than one visit per week. In contrast, healthy newborns are

swaddled, cooed-at, rocked, fed, and burped for hours each day by their mothers. This lack of interaction in a mother-infant dyad is believed by some to have severe effects on the infant. Research by Klein and Stern (1971) discovered that child neglect and abuse was seen more often with premature infants than with full-term infants and may be a result of poor mother-infant bonding and poor relationship building.

Effects Of Touch On Mother's Behavior

Klaus and Kennell (1982) found in a study with 73 infants, that mothers' attentiveness to their infants was improved when they had extra daily contact in the ICN with their premature infants. They were encouraged to look directly at their babies, and to talk and stroke them when such activities could be tolerated. Long term effects were found: attachment of mother (measured by amount of smiling and hugging observed) to child was increased at 1 month, 1 year, and 2 years as compared to infants not receiving extra contact from their mothers.

In a study with 78 infants Rosenfield (1980) found that the average visiting rate of mothers was increased when premature infants received two 20-min

periods of proprioceptive and vestibular stimulation per day by the staff. The infants were rocked, stroked with various materials, and their extremities were flexed and folded. The infants began to respond to their environment more, and the mothers responded by increasing their visiting rate which could further increase the infant's activity. This reciprocal relationship of physical activity influencing infant behavior, which in turn influences the mother's behavior, is a very important behavioral pattern to establish. If premature infants can be made to interact more with their environment, then parent visiting rates and the nursing staffs' interaction with the infants may increase, perhaps because of the joy one receives from interacting with an alert infant. This type of behavioral trapping may generalize to the home where the parent or parents may continue to interact with their infants, which increases the infant's engaging rate.

Negative Effects Of Touch

Not all types of tactile stimulation in the ICN are beneficial. In fact, earlier studies found a higher rate of negative touch (medical procedures)

than positive touch (holding, rocking, burping, feeding, stroking) (Marton, Dawson, & Minde, 1980). A transcutaneous monitoring device (TCM) has been used in various studies to observe which procedure or type of handling is detrimental (Gorski, Hole, Leonard, & Martin, 1983; Long, Philip, & Lucey, 1980). The TCM reflects the blood oxygen level in the infant's body, and marked decreases in the digital reading would reflect an activity that the infant could not tolerate. Medical procedures (e.g., venipunctures, radial and brachial arterial blood gas sampling, lumbar and heel punctures, suctioning, and positioning for x-ray films) are very stressful to the premature infant, as reflected in lowered blood oxygen levels.

Positive Effects Of Touch

Length of hospital stay may decrease with positive tactile stimulation since it was found in a study by Kattwinkel (1974) of 29 premature infants, that apnea of prematurity (a temporary cessation of breathing) was decreased by the use of cutaneous stimulation and continuous positive airway pressure (CPAP, air/oxygen given to infants to maintain a slight lung inflation after expiration). Apnea

contributes to delay of discharge from the hospital. In a study by Naqvi and Hyatt (1980) with 30 premature infants, 15 infants received 30 min of stimulation therapy 5 days/week until discharge. Tactile stimulation around the oral area, stroking the skin, visual, and auditory stimulation were given. Improvement was seen in the sucking, swallowing, and breathing coordination of the premature infants. Average length of hospital stay was 9 days less for the stimulation group. Statistical significance was not reported.

Sokoloff, Yaffe, Weintraub, and Blase (1969) studied 10 premature infants. Five infants were stroked 5 min every hour for 10 days. A control group of the remaining 5 infants received the routine nursery care. Weight gain, activity levels, and growth and motor development were increased in the experimental group. Due to the small sample size no statistical procedures were performed.

White and Labarba (1976) studied 12 premature infants chosen at random in an ICN. Tactile and kinesthetic stimulation (rubbing the infants' body and flexing the extremities) was given four times a day

for 15 min periods. The stimulation was given for 10 days to the 6 experimental group infants. At the end of the 10 days, the experimental group gained more weight ($p < .05$), required fewer feedings ($p < .05$), and consumed more formula per day ($p < .025$) than the 6 control group infants.

Scarr-Salapatek and Williams (1973) began a stimulation program with an experimental group of 15 infants receiving extra handling by the nursery staff (fondling, rocking, and patting during feedings) for 6 weeks during hospital stay. The 15 premature infants in the control group received only the minimal stimulations necessary at feeding times. After discharge, home visits were made to the infants in the experimental group. The social worker instructed and demonstrated techniques of stimulating infants in fine motor, gross motor, verbal, cognitive, and self-care areas. Observing the infant's behaviors was also included in the instructions so that the mothers could assess what behavioral steps the infants had taken, and what behaviors to aid in developing. Assessments of the infants' neurological and developmental status were done at specific times during the study. Before

discharge, little difference was seen. At 4 weeks post discharge, the experimental group was slightly superior to the control group in development. At 1 year, the experimental group was functioning at a significantly higher developmental level ($p < .02$). The range of Cattell I.Q. scores was equal for both groups but only 22% of the experimental group scored below 90 while 67% of the control group scored below 90. Specific reference to neurological status was not made. In summary, the nursery stimulation program plus the post discharge extra-stimulation provided the experimental group with a developmental advantage at 1 year chronological age.

Rice (1975) trained 15 mothers to give tactile-kinesthetic stimulation to their premature infants, starting the day the infants were discharged from the hospital. This stimulation program has been called the Rice Infant Sensorimotor Stimulation. When each infant was 4 months old (chronological age), an examination was given by a pediatrician, psychologist, and pediatric nurse. Results indicated that the stimulated infants had statistically significant weight gains ($p < .04$), neurological development

($p < .001$), and mental development ($p < .05$) using the same balanced weight scale, presence or absence of specific reflexes, and the Bayley Scales of Infant Development, respectively.

Material As A Source Of Tactile Stimulation

Of all the studies done that demonstrated the positive effects of touch, none has been so dramatic a portrayal as Harry F. Harlow's work with rhesus monkeys. Few college-educated individuals have not witnessed the video scenes of the monkeys clinging to each other through a wire mesh or cuddling with a cloth, non-feeding surrogate mother instead of a wire, feeding surrogate mother.

The use of cloth as a source of contact comfort may have been one of Harlow's greatest contributions. It was found that "contact comfort was an important basic affectional or love variable....[which] overshadowed so completely the variable of nursing" (Harlow & Mears, 1979, p.100). It was also believed that the cloth contact gave the infant monkeys more security (Harlow, 1958).

Another beneficial use of material was demonstrated in a NOVA television report, A Touch of Sensitivity (WGBH Educational Foundation, 1980). A study using sheepskin under premature infants' bodies was discussed, and increases in weight gain, decreases in apneic incidents, and improvements in feeding tolerance were noted with just the addition of a sheepskin. The number of subjects, procedural details, and the statistical significance were not discussed. The researchers speculated that the tactile stimulation of the wool was the causal factor.

The present study attempted to combine the effect of material continuously placed under the body (improved weight gain, feeding tolerance, and decreased apnea) with the contact comfort of a soft material to hug. This study differs from previous ones in that a specially designed stuffed animal gave continuous tactile stimulation around the premature infants for a 2-3 week period. The use of a Premie Pal (a light-weight, soft, stuffed animal) to be kept in contact with a premature infant's body while the weight gain, parent visiting rate, length of hospitalization, and activity level of the infants

were observed was chosen because it was inexpensive, non-invasive, easy to administer, easy to observe, and required minimal nursing intervention. It was also hypothesized that using a toy shape would remind the ICN nursing staff that they are caring for babies, not just wires and tubes.

Tactile stimulation, as opposed to other types of stimulation was chosen because touch is the infants' earliest sense to be developed (Montagu, 1978, p.1). Material, as opposed to hands-on stimulation, was chosen because of ease of administration and of maintaining consistency. It was hypothesized that the infants in the experimental group would return to their birth weight faster; show an increase in responding to the environment (more time in a quiet alert state); would be discharged from the hospital sooner; and, that their parents would increase their visiting rate ahead of the control group. The nursing staff, acting as role models for the parents, might prompt the parents to increase their interaction with their infants. Increased stimulation for the premature infants was expected to increase the infant's interaction with the environment, and in

return encourage more infant-nurse and infant-parent communication.

Method

Setting

The 10 bed intensive care nursery at Modesto City Hospital (MCH) in Modesto, California was the setting for this study. It had one large room (approximately 10 m by 20 m) with one nursing station partitioned off by a 1.3 m high desk, 4/5's the length of one wall. Infants were placed on open warming tables or in isolettes (beds enclosed by plexiglass, that provide heat). The staffing in the intensive care nursery consisted of one respiratory therapist, four to seven nurses, one pediatrician on call at night but not always present in the nursery, and the daily visits of attending physicians caring for individual infants. Full illumination was provided, however, blankets were sometimes placed over the tops of isolettes to decrease the light on individual infants. The infants under phototherapy for the treatment of jaundice had eyepatches on approximately 85% of the time. Auditory alarms were on all monitors, including cardiac, respiratory, transcutaneous oxygen monitoring devices,

heater output on warming tables and isolettes, and ventilators. The average number of infants present was typically 5 to 7, both during the study and at other times. Permission to run the study was obtained by first introducing the concept to the ICN medical committee and gaining their support; second, getting approval from the administration; and third, clearing the parental consent form (Appendix A) with the legal advisors for MCH. A factor facilitating permission attainment was that I was employed full-time on this unit for approximately 36 hrs/week.

Participants

Infants were admitted to the intensive care nursery (ICN) on the basis of respiratory status, cardiac status, possible candidacy for infection, prematurity, difficult delivery with subsequent low Apgar score, low blood sugar, or congenital abnormalities that were life threating. Over a period of 4 months, 20 participants for this study were chosen using three criteria: (a) weight less than 2500 gm, (b) gestational age between 30 and 34 weeks per the Newborn Maturity Rating and Classification (Ballard, Novak, & Driver, 1979; see Appendix B), and

(c) parental permission granted. Infants requiring surgery or possible transfer to tertiary centers were not included. Only infants newly admitted were used, and the intervention program was not begun until the infants were in stable medical condition (determined by ventilator settings of CPAP or a breath rate less than 10 per min, and oxygen requirements less than 50% FiO2). Infants were alternately assigned to control and experimental groups upon consecutive admission to the ICN. The placement of the first infant into the experimental or control group was decided by the flip of a coin. Throughout the 9 month period, there were as few as 1 infant involved in the study and as many as 4 in a given week.

Procedure

Consent and educating the parents. Parental consent was obtained prior to placement of an infant into a study group, and was obtained within 24 hours of the infant's admission to the nursery when possible. The parents were told that an infant stimulation program was in existence at MCH, that the pediatricians and the hospital administrators approved of it, that the program would continue for a minimum

of 2 weeks and a maximum of 3 weeks, that they could withdraw their child from the study at any time, and that all infants would receive the standard, normal intensive care provided at the nursery. The parents were not told which group their infant was placed into. Parents were told that the infant stimulation program consisted of using a small stuffed animal (Premie Pal) especially designed to be in direct contact with the infant's skin to offer comfort and support, and that it might not always be in use when they visited their infant. This last statement was included to reduce suspicion by the control group parents when no Premie Pal was seen. Twins admitted to the ICN and meeting the study qualifications were placed into the same study group when the parents were not in agreement with differential treatment for their children. One set of twins was split and one set not split into control and experimental groups. Only four of the 24 parents approached were reluctant to have their infants participate in the study; they were reassured that their opinions would be respected. Parents that requested that their infant be placed in a certain group, experimental or control, were told

that the alternating of infants for the group assignment was an important part of the study, and if they were not comfortable with this then their infant would not be included in the study. There were two parents whose infants were not a part of the study but who expressed an interest in the Premie Pal. They were told that an infant stimulation program was in progress and that if any benefit was found with the use of the Premie Pal then the stuffed animal would be available to all premature infants.

The charge nurse on duty at the time of the admission was asked to assign the infant to the appropriate group and to obtain the parental consent. On occasion I was the charge nurse. When it was not possible to either assign an infant to a group or to obtain parental consent immediately upon admission, I obtained parental consent and assigned the group within 72 hours of admission.

Educating the staff. The ICN nursing staff and the respiratory therapists working in the ICN were told that a study on tactile stimulation of the premature infant was now in progress in this nursery. They were informed that the purpose was to see if the

Premie Pal had any effect on the clinical course of the premature infants in the experimental group and that the Premie Pal was the only difference in the care that the experimental infant group received versus the control group. They were asked to comply by keeping the Premie Pal in contact with the skin of the experimental group infant, and were asked not to duplicate this procedure with the infants in the control group nor to duplicate the Premie Pal positioning with other commercially bought toys (such as teddy bears, dolls, musical animals) that might be present at a contol infant's bedside. The estimated rate of compliance by the nursing staff was 80%, based on nonsystematic observation when I was on duty. The staff were also educated on the possible situations that would inhibit the use of the Premie Pal. Those situations included: (a) feeding; (b) medical procedures, such as intubation, arterial line placement, lumbar puncture; (c) bathing; (d) holding the infant; (e) repositioning; (f) suspected infant intolerance to the stimulation (i.e., increased irritability, color change, increase oxygen needs, or the transcutanous monitoring device registering a

prolonged drop after the Premie Pal was placed next to the infant); and (g) when an infant was placed in a crib and swaddled with blankets. Pictures of possible placement of the Premie Pal were available at the desk. See Appendix C for pictures and a copy of the instructions placed at the bedside of each study infant for the staff to read. A fuzzy, teddy-bear sticker was placed on the weight cards attached to the beds to alert the staff of that infant's enrollment in the study. A small, medicine card was also placed in the kardex of each study infant to remind the staff to chart the infant's activity level as they routinely do each hour.

Tactile stimulation. After consent was obtained from one parent, and as soon after birth as possible, the infants in the experimental group had a soft, flexible, light-weight, stuffed animal ("Premie Pal") placed in direct contact with their bodies. The Premie Pal was made by the experimenter and consisted of a beige (so it would not be visually stimulating), soft velour, lightly stuffed animal with weighted hands and feet (The striped model, pictured in Appendix C, was not used in the study.) The light-

weight torso, arms, and legs of the toy could be placed over the infant's body, head, or limbs without causing restricted breathing, or leaving pressure marks on the skin. The Premie Pal was kept in continuous contact with the body of the infant for a minimum of 2 weeks to a maximum of 3 weeks except for situations (a) through (g) listed on the preceding page. The Premie Pals were sometimes deliberately placed so that the infant was unable to pull or push on tubes or wires in the bed. Infants under phototherapy (for reduction of jaundice) had the Premie Pal placed over their head and/or groin area since it is optimum to have as large a body surface area as possible exposed to the light, and since diapers and masks are regularly used during this treatment.

Direct observation. During the 2-3 weeks that the study was in progress for individual experimental and control infants, the bedside nurse made observations each hour on the activity level of each infant. Categories of recorded activity levels for the study infants were (a) sleep, (b) drowsy, (c) quiet alert, (d) active, and (f) crying. Definitions

of infant activity levels are presented in Appendix D and were adapted from the Barnard, Blackburn, Kang, and Spietz (1977) infant state scale.

Observer agreement was periodically checked by comparing the observational records with those of the experimenter. The observations made by the experimenter were at irregular intervals throughout this study, with a minimum of 15 observation checks per week. Percentage agreement for occurrence of all behaviors was calculated using the formula agreement/(agreement + non-agreements) in which only occurrences of behaviors were considered. An interobserver agreement of greater than 80% per week was maintained.

Indirect observation. Archival data from the patients' charts were used. The length of hospital stay, daily weights, and parent visits were recorded as part of standard nursing charting. All archival data were obtained after the 2-3 week study period for individuals in both the experimental and control groups and without the knowledge of the ICN nursing staff. The hospital administration and the ICN nursing coordinator were aware that these data were being compiled by the experimenter.

Results

Data obtained for each group on each of the four dependent variables (weight gain, parent visiting rate, length of hospital stay, infant activity level) are presented in Table 1. Experimental and control data were examined for differences in the means and trends during the study. The *t* test was used for mean differences in weight gain (days to return to birth weight), parent visiting rate, and length of stay. Infant activity levels were examined for the percentage of time spent in each behavioral state. Since only slight differences were seen in the activity levels no further statistical analysis was done.

Significant differences between the control and experimental groups in the mean days to return to birth weight and mean length of hospitalization were found. However, it was the control group which demonstrated a quicker return to birth weight and a shorter hospitalization stay. This was most likely due to the significant variation ($t(18)=3.05$, $p=.006$) in gestational age between the two groups. The younger, smaller, sicker infants (whose hospital

Table 1

Data on each of the four dependent variables: weight gain, parent visiting rate, infant activity level, and length of hospital stay.

DEPENDENT VARIABLES	EXPER. GROUP MEAN	SD	CONTROL GROUP MEAN	SD	t-test, df, & prob.
Days To Return To Birth Weight	17	9.14	8.2	7.78	$t(18)=2.31$ $p=.03$
Parent Visiting Rate/Day					
before program	1.4	0.93	1.4	0.71	$t(18)=0.18$ $p=.65$
during program	0.9	0.53	1.2	0.95	$t(18)=0.77$ $p=.46$
after program	0.7	0.51	0.8	0.68	$t(18)=0.5$ $p=.62$
Length of Hosp. Stay/Days	48.8	30.80	17.2	8.70	$t(18)=3.12$ $p=.005$
Infant Activity Level (% of time in each level)					
sleep	59%		63%		
drowsy	16%		14%		
quiet alert	5%		3%		
active	18%		17%		
crying	2%		3%		

Note: All t tests are two-tailed.

course would be more complicated) were placed in the experimental group (see Table 2). The alternate assignment of experimental and control groups by consecutive admission to the ICN did not result in equivalent groups. No significant differences were observed for Apgar Scores at 1 and 5 min nor for sex distribution. This data is in Table 2.

Parent visiting rate, averaged out over the entire hospitalization period was 0.99 visits per day for the experimental group and 1.15 visits per day for the control group (Table 1). This tactile stimulation program did not increase the visiting rates, and a gradual decline was seen from pre-treatment phase, to treatment phase, to post-treatment phase for both groups.

The infant activity levels did demonstrate a slightly positive result (Table 1). Experimental infants spent less time sleeping and crying, and slightly more time in the drowsy, quiet alert, and active levels, which may have been due to the positive interaction the premature infants had with the Premie Pal, staff, and their parents. However, the mean differences are so small, they are not reliable and are of no practical significance.

Table 2

Mean differences in birth weight, Apgar score, gestational age and sex distribution of study infants.

VARIABLES	EXPERIMENTAL GROUP N=10	CONTROL GROUP N=10	*t*-test, df, and probability
Mean Birth Weight	1549gm	1920gm	$t(18)=2.76$, $p=.01$
Mean Gestational Age	31.25 wks	33.0 wks	$t(18)=3.05$, $p=.006$
Mean Apgar Score			
at 1 min	5.2	6.4	$t(18)=1.02$, $p=.32$
at 5 min	6.5	7.9	$t(18)=1.45$, $p=.16$
Number of each Sex	M=5, F=5	M=5, F=5	

Note: All *t*-test probabilities are two-tailed.

Discussion

With the small size of the study group (n=20) and the lack of initial equivalence of the control and experimental groups (experimental group gestationally 2 weeks more premature) strong conclusive remarks cannot be made regarding the effect of this type of tactile stimulation program. The results did not support the predictions made.

Since the recording of archival data (weight gain, parent visiting rate, and length of hospital stay) was part of the routine nursing function, and since the ICN nursing staff were not aware that these measures were included in the study, nurse record keeping bias and reactive assessment threats to measurement validity were eliminated. With a control and experimental group design, history and maturation sources should have affected both groups equally and therefore be balanced out.

Experimenter expectancy bias did not affect the direct observations since those were made by the bed-side nurse and not the experimenter. With the collection of data from the archival sources 1 year after the study, and with the use of medical record

numbers to retrieve the data, the experimenter did not know what study group a particular infant had been in and therefore did not bias the archival data.

Interobserver agreement for direct observations of greater than 80% decreased the instrumentation threat to internal validity. However, diffusion of treatment, compensatory rivalry, and equalization of treatments may have remained problems since the staff felt the Premie Pal was a valuable asset to the infant's care. Frequent requests were made by staff for a Premie Pal for other infants and comments such as "Ah, he doesn't get one; he could really use one," were made regarding the control infants. The unit policy of keeping infants uncovered while needing close observation did prevent swaddling the infants, and the periodic checks and reminders to the staff not to duplicate the tactile treatment did help reduce the problem of diffusion and equalization of treatments.

The validity of statistical conclusion most likely suffered because the number of infants was small. Also, random irrelevancies were unavoidable in the ICN, such as patient census changing rapidly and nursing staff shortages sometimes existing. These

factors may have hindered the validity because when ICN nurses are under more stress due to high nurse/ patient ratios, priorities are established and placement of the Premie Pal, recording of parent visits or infant activity levels are not high priorities. Some actions on the part of the experimenter may have, however, improved the overall validity. Examples of these actions included: providing the observers with clear definitions of infant activity levels, providing the nursing staff with a precise treatment plan for placement of the Premie Pal, and being present in the nursery at various times.

Other biases did exist. The six physicians that saw patients regularly in the ICN were not evenly distributed amongst the study infants. Table 3 is a

Table 3

Physician coverage for study infants.

STUDY GROUPS	PHYSICIANS:	A	B	C	D	E	F
Experimental		0	2	6	1	0	1
Control		1	4	1	3	1	0

representation of primary coverage for study infants. Physician C had 6 infants in the experimental group and 1 in the control group. Physician C's style of medical practice was different from that of the other physicians. One consistent difference was that he preferred to discharge infants at a later date.

Anecdotal comments made by parents and nurses demonstrate a personal touch in the ICN prompted by the Premie Pal. Such comments included:

-"Look, she's cuddling with her Premie Pal."

-"I'm glad my girls have one because being twins they must have felt lonely in the isolettes, separated from each other."

-"....baby sleeping soundly with the Premie Pal."

-"I wish I had one to sleep with."

-"When can we have more Premie Pals? There are a few kids who could really use one."

The most remarkable comment came 2 years after the active phase of the study when a parent was met by chance. She said, "My daughters are still sleeping with their Premie Pal. It really makes them feel comfortable."

If this study were to be repeated, controlling the equality between groups would be paramount. Since alternate consecutive assignment to study groups did not result in equivalent groups, then matching for weight, gestational age and physician coverage should be considered. The following recommendations could also assist in reaching more certain conclusions with the use of a Premie Pal:

1. Using a larger, homogeneous study group with patients under only one attending physician's care.

2. Recording the individual responses to the Premie Pal, i.e., autonomic and motor changes to determine if the infants are using more energy and burning calories that could go toward weight gain instead.

3. Adding a third study group that would have the Premie Pal for a specific, shortened period of time.

4. Assessing each premature infant (using the Assessment of Preterm Infants' Behavior and/or Bayley Scales) before, during, and after the study.

5. Recording caloric intake on study infants.

The answer to why differences were obtained in other studies and not in this study may have been clearer if some of the above recommendations had been followed.

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Appendix A

Consent for Participation in Stimulation Program

I, _____,

give my consent for my son/daughter

_____ to participate in an infant stimulation program at Modesto City Hospital Intensive Care Nursery being conducted by Dianne Kennedy, R.N. I realize that my child will receive the standard, normal intensive care provided all infants at the nursery. I also realize that the study will continue for two to three weeks and that I will assist in the program as necessary. I can withdraw my child from the study at anytime.

_____

Parent signature

_____

Witness

_____

Date

Appendix B

GESTATIONAL AGE ASSESSMENT (Ballard)

NAME _____ DATE TIME OF BIRTH _____ BIRTH WEIGHT _____

HOSPITAL NO. _____ DATE TIME OF EXAM _____ LENGTH _____

AGE WHEN EXAMINED _____ HEAD CIRC. _____

RACE _____ SEX _____ EXAMINER _____

APGAR SCORE: 1 MINUTE _____ 5 MINUTES _____

NEUROMUSCULAR MATURITY

NEUROMUSCULAR MATURITY SIGN	SCORE 0	1	2	3	4	5	RECORD SCORE HERE
POSTURE							
SQUARE WINDOW (WRIST)	 90°	 60°	 45°	 30°	 0°		
ARM RECOIL	 180°		 100 - 180°	 90 - 180°	 90°		
POPLITEAL ANGLE	 180°	 160°	 130°	 110°	 90°	 < 90°	
SCARF SIGN							
HEEL TO EAR							
						TOTAL NEUROMUSCULAR MATURITY SCORE	

PHYSICAL MATURITY

PHYSICAL MATURITY SIGN	SCORE 0	1	2	3	4	5	RECORD SCORE HERE
SKIN	gelatinous red, transparent	smooth, pink, visible veins	superficial peeling, & or rash few veins	cracking pale area rare veins	parchment deep cracking no vessels	leathery cracked wrinkled	
LANUGO	none	abundant	thinning	bald areas	mostly bald		
PLANTAR CREASES	no crease	faint red marks	anterior transverse crease only	creases ant 2/3	creases cover entire sole		
BREAST	barely percept	flat areola no bud	stippled areola, 1-2mm bud	raised areola, 3-4mm bud	full areola 5-10mm bud		
EAR	pinna flat, stays folded	sl curved pinna; soft with slow recoil	well-curv pinna; soft but ready recoil	formed & firm with instant recoil	thick cartilage ear stiff		
GENITALS (Male)	scrotum empty no rugae		testes descending few rugae	testes down good rugae	testes pendulous deep rugae		
GENITALS (Female)	prominent clitoris & labia minora		majora & minora equally prominent	majora large, minora small	clitoris & minora completely covered		
						TOTAL PHYSICAL MATURITY SCORE	

Reference

Ballard JL, Novak KK, Driver M. A simplified score for assessment of fetal maturation of newly born infants. *J Pediatr* 95:769-774, 1979. Reprinted by permission of Dr Ballard and *Journal of Pediatrics*

SCORE

Neuromuscular _____

Physical _____

Total _____

MATURITY RATING

TOTAL MATURITY SCORE	GESTATIONAL AGE (WEEKS)
5	26
10	28
15	30
20	32
25	34
30	36
35	38
40	40
45	42
50	44

GESTATIONAL AGE (weeks)

By dates _____

By ultrasound _____

By score _____

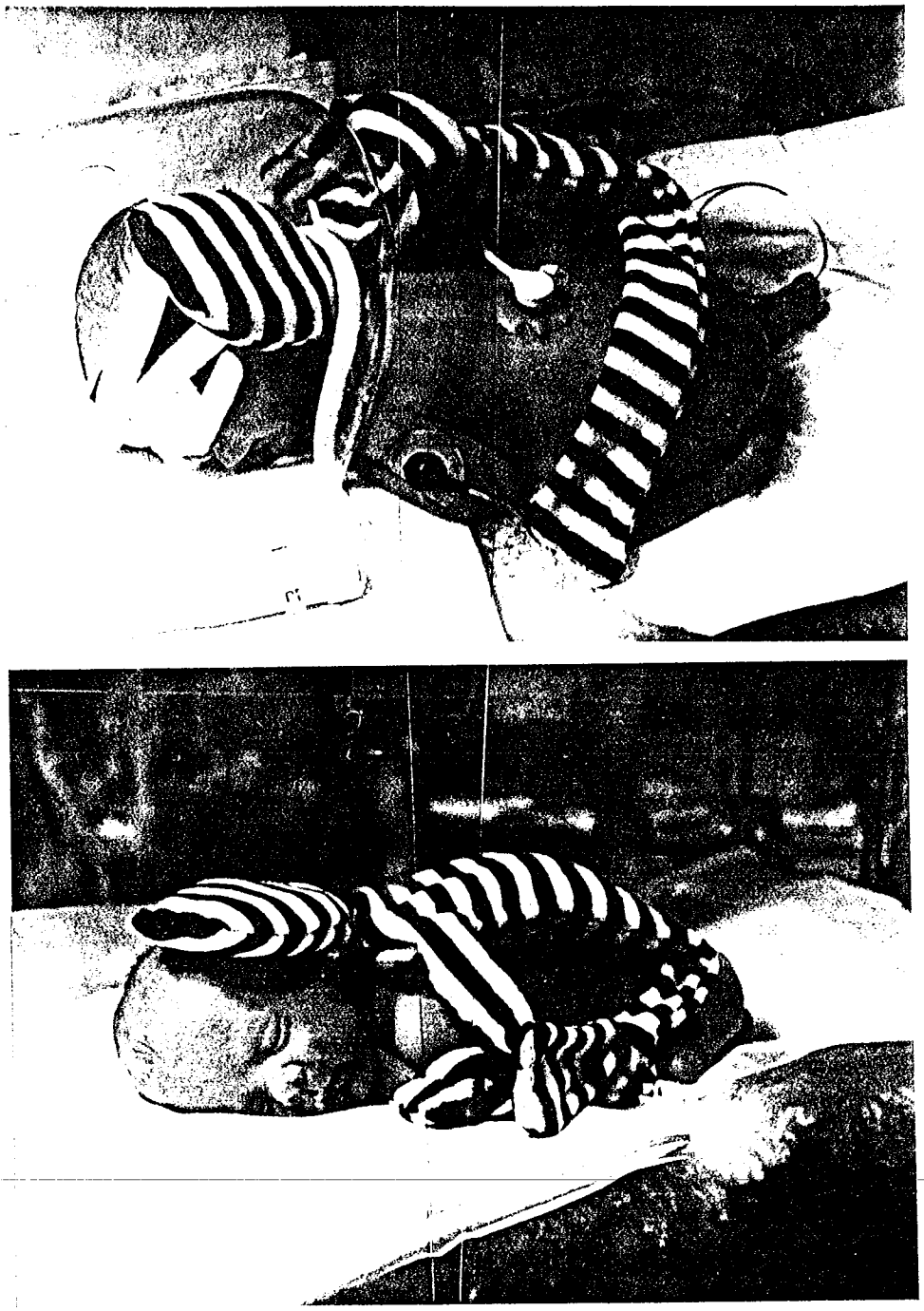
Appendix C

Instructions for Use of Premie Pal

The Premie Pal is to be kept in continuous direct contact with the premature infant's body who is selected for the 2-3 week treatment program. Proper placement will be to place the arms and/or legs of the soft, flexible, light-weight, stuffed animal over the infant's body to give comfort, warmth, and support while the infant is in various positions. The stuffed animal may be used as "restraints" or to help position the infant on it's side. Infants under phototherapy can have the stuffed animal's limbs placed over the head and/or groin area. One animal is to be used per infant in the experimental group. Sample pictures of a Premie Pal in use are available at the desk.

The following situations should inhibit use of the Premie Pal: (a) feeding, (b) medical procedures, such as intubation, arterial line placement, lumbar puncture, (c) bathing, (d) holding the infant, (e) repositioning, (f) suspected infant intolerance to the stimulation (i.e., increased irritability, color change, increased oxygen needs, or the transcutanous

monitoring device registering a prolonged drop after the Premie Pal is placed next to the infant), and (g) when an infant is placed into a crib and swaddled with blankets.



Appendix D

Infant Activity Levels

Levels	Descriptions
sleep	quiet, eyes closed, minimal or no movement, respirations fairly regular
drowsy	mild startles, eyes open & close, some facial movements, regular resp.
quiet alert	brightening and widening of eyes, attempting to focus, minimal movement, reg. resp.
active alert	much body activity, periods of fussing, much facial movement
crying	crying, grimacing, color changes, eyes tightly closed or open

Adapted from Barnard, K. E., Blackburn, S., Kang, R., & Spietz, A. (1977). Infant State Scale. In A staff development program in perinatal nursing care. White Plains, NY: The National Foundation/March of Dimes.